AB/2172

Atty Docket No. 005550.P002 *Patent*

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**
**BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

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|---|---|---|
| In re Application of: | ) | Examiner: Ly, Anh |
| Sah, et al. | ) | Art Unit: 2172 |
| Serial No. 09/923,498 | ) | |
| Filed: August 6, 2001 | ) | |
| For: STORAGE OF ROW-COLUMN DATA | ) | |

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

## APPEAL BRIEF UNDER 37 C.F.R. § 41.37

This is an appeal to the Board of Patent Appeals and Interferences from the decision of the Examiner of Group 2172, dated July 9, 2004, in which claims 1-54 in the above-identified application were finally rejected. This Appeal Brief is hereby submitted pursuant to 37 C.F.R. § 41.37(a).

## I. REAL PARTY IN INTEREST

The real party in interest is the assignee of the full interest in the invention, SenSage, Inc., 74 New Montgomery Street, San Francisco, CA 94105.

## II. RELATED APPEALS AND INTERFERENCES

To the best of Appellant's knowledge, there are no appeals or interferences related to the present appeal that will directly affect, be directly affected by, or have a bearing on the Board's decision in the instant appeal.

## III. STATUS OF THE CLAIMS

Claims 1-54 are pending in the application and were finally rejected in an Office Action mailed July 9, 2004. Claims 1-54 are the subject of this appeal. A copy of Claims 1-54 as they stand on appeal are set forth in Appendix A.

## IV. STATUS OF AMENDMENTS

No amendments to the claims have been made after receipt of the Final Office Action mailed on July 9, 2004.

## V. SUMMARY OF CLAIMED SUBJECT MATTER

Appellant's invention as claimed in claims 1-51 is a data management system that stores table data by parsing the table data into columns of values, formatting each column into a data stream, and transferring each data stream to a storage device for storage as a continuous strip of data. The strip of data is stored as a file that is not structured as a series of pages. The parsing represents each column on a temporary storage as a strip of data. The formatting may apply a compression algorithm to the strip of data before it is stored on a storage device. (Figure 2A, page 13, lines 1-12; Figure 1A, page 6, line 21 through page 7, line 4; and Figure 4C, page 25, lines 2-17) In one embodiment, the compression algorithm creates a code for each value and replaces each value in the strip of data with the corresponding code (Figures 3A-D, page 14, line 17 through page 18, line 5). The formatting may also format multiple columns into a single data stream (Figures 2B-C, page 13, lines 13-23). In addition, claims 40-51 claim a particular arrangement of compute and storage nodes coupled together in a data management system that performs the claimed functions, which are distributed across the compute and storage nodes ( Figures 1A-B, page 5, line 20 though page 7, line 4).

Appellant's invention as claimed in claims 52-54 is a data structure corresponding to the continuous strip of data that represents a column on either temporary or permanent storage (Figures 2A-C, page 12, line 24 through page 13, line 23).

## VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

I. Claims 1-51 as rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 5,794,229 to French et al. in view of U.S. Patent No. 6,115,705 to Larson.

II. Claims 52-54 as rejected under 35 U.S.C. § 103(a) over French.

## VII. ARGUMENTS

I. Claims 1-51 are Patentable under 35 U.S.C. § 103(a) over the combination of French and Larson.

French discloses a database system that stores table data vertically by first parsing the table data into columns. Each column is stored on disk as a set of linked database pages of a predetermined size. Each page also includes a header and a pointer to a linked page. The system allocates each column value ("cell") to a particular page using a hashing algorithm. Once the data is stored, the cells on the linked pages may be output as a data stream.

Larson discloses a database system that buffers incoming data in volatile memory before writing it to non-volatile memory. The volatile memory is divided into a pool of pages for use by a query processor. As records are stored, the query processor determines an appropriate page for each record. When a page becomes full, the query processor links a free page from the pool to the full page. If there are no free pages, the query processor writes a page to non-volatile memory.

### *A. Claims 1-3, 14-16, and 27-29*

Claims 1-3, 14-16, and 27-29 stand or fall together. Claim 1 is the representative claim. Claim 1 claims that each column of data in a table is represented as a continuous strip of data in a temporary storage, that each column is formatted into a data stream, and that each data stream is stored on a storage device as a continuous strip of compressed data. Claim 1 further includes the limitation that the continuous strip of compressed data is stored without regard to a page size for the storage device.

The Examiner asserts that French discloses the storing of data as a continuous strip of compressed data without regard to a page size. Appellant respectfully submits that the Examiner has misinterpreted French.

First, the Examiner appears to be asserting that French's first-stage compression (Figures 4A-D, column 13, lines 40-55) is analogous to Appellant's claimed limitation of storing of data on a storage device without regard to a page size. (Final Office Action, page 3, line 9: "see figs. 4A-4D the boundary of storage is never to reach: col. 13, lines 40-55"). This is a complete misunderstanding of French. French discloses defining column cells as a data type that is capable of holding a value larger than the maximum data value in the column. The data in the cells is compressed by discarding the unused bits of each cell ("natural data reduction"). Appellant can find no teaching or suggestion in French that compressing a cell allows the storage of data without regard to a page size. Furthermore, Appellant respectfully asserts that no one of skill in the art would confuse the compressing of data before storing with the storage operation itself.

Second, French determines which page a cell belongs on using a hashing algorithm that is based, in part, on the page size.

> After miscellaneous setup (as indicated by the comment at line 4), the method calculates for this cell (from the cell ID) which page or block number the cell resides. This is done, at line 7, by an integer divide using ***cells per page*** (i.e., __RecsPerBlock). The method next, at line 9, determines the logical cell number (record number) for the cell within the block or page. After these calculations, the method knows the particular block or page and the offset within that page where the cell resides. [French: col. 46, line 66 through col. 47, line 7 (describing the source code to insert a new cell into a storage device page), emphasis added]

Because the number of cells per page is determined by the page size, French clearly considers the page size of the storage device when storing cells. Furthermore, at column 13, lines 26 through 29, French describes storing the cells for a column in page chain. If French did store the cells as a continuous strip of data without regard to a page size, there would be no need for French to link pages together into a chain because the data would not be partitioned into pages. Therefore, the Examiner's interpretation of French is contrary to French's own teaching.

Third, each page in French contains both a header and a link. Thus, the data cannot stored as a continuous strip on a storage device because the header and link are interleaved within the stored data.

Finally, it appears the Examiner is interpreting French's ability to *read* the stored data as a data stream as equivalent to *storing* the data in a continuous strip. As well-

known in the art, reading and storing data are non-equivalent operations. French clearly describes the storing of cells on a chain of linked pages, not as a continuous strip of data. Therefore, the Examiner's interpretation that French stores data in a continuous strip is not only contrary to French's own teaching, but also contradicts the well-known distinctions in the art between reading and storing data.

The Examiner admits that French does not disclose representing each column as a continuous strip of data in a temporary storage as claimed, and is relying on Larson to teach this limitation. However, Larson clearly states that the volatile memory is divided into pages and that the pages are linked. Thus, the links between the pages are interleaved within the data so the stored data in Larson cannot be properly interpreted as a contiguous strip of data as claimed by Appellant.

Because the combination of French and Larson does not disclose each and every limitation of claim 1, Appellant respectfully requests the Board reverse the rejection of claims 1-3, 14-16, and 27-29 under 35 U.S.C. § 103(a) over the combination.

***B. Claims 4-10, 17-23, 20-36 and 43-47***

Claims 4-10, 17-23, 20-36 and 43-47 stand or fall together. Claim 4 is the representative claim. In Claim 4, Appellant claims that the values in the data stream is compressed by creating a code for each value and replacing each value with the code.

The Examiner is relying on French's code generator as described at column 8, lines 1-12 as equivalent to Appellant's claimed element. Appellant respectfully submits that the Examiner has misinterpreted the function of the code generator. French clearly states that the code generator creates a set of instructions that carry out a query on the stored data. There is no teaching or suggestion that the code generator creates a code for a value or that the code is substituted for the value. Larson contains no disclosure directed at compressing values as claimed by Appellant.

Therefore, the combination of French and Larson does not disclose each and every limitation of claim 4, and Appellant respectfully requests the Board reverse the rejection of claims 4-10, 17-23, 20-36 and 43-47 under 35 U.S.C. § 103(a) over the combination.

*C. Claims 11-13, 24-26, 37-39 and 48-50*

Claims 11-13, 24-26, 37-39 and 48-50 stand or fall together. Claim 11 is the representative claim. Claim 11 claims the formatting of multiple columns into a single data stream.

The Examiner asserts that column 12, lines 37-50 and the Abstract in French disclose the formatting of multiple columns into a single data stream. Appellant has carefully read the cited sections, and the rest of French, and can find no disclosure that either teaches or suggests Appellant's claimed limitation. Larson also fails to disclose the claimed limitation.

Therefore, the combination of French and Larson does not disclose each and every limitation of claim 11, and Appellant respectfully requests the Board reverse the rejection of claims 11-13, 24-26, 37-39 and 48-50 under 35 U.S.C. § 103(a) over the combination.

*D. Claims 40-42 and 51*

Claims 40-42 and 51 stand or fall together. Claim 40 is the representative claim. Claim 40 claims a data storing system comprising a plurality of compute nodes and a plurality of storage nodes coupled together. The processing claimed in method claim 1 are distributed among the compute and storage nodes for execution.

The Examiner asserts that French's client-server environment is equivalent to Appellant's claimed node arrangement. However, French does not disclosed a plurality of computer and storage nodes that are coupled together as claimed. Furthermore, French does not teach or suggest the distribution of processing among the compute and storage nodes as claimed. Larson also fails to disclose either the claimed node arrangement or claimed distributed processing.

Therefore, the combination of French and Larson does not disclose each and every limitation of claim 40, and Appellant respectfully requests the Board reverse the rejection of claims 40-42 and 51 under 35 U.S.C. § 103(a) over the combination.

II. Claims 52-54 are Patentable under 35 U.S.C. § 103(a) over French.

Claims 52-54 stand or fall together. Claim 52 is the representative claim. Claim 52 claims a data structure containing a header and a plurality of data fields. The data fields form a continuous strip of data for storing the data without regard to a page size for a storage device. The data structure also contains a header that identifies the column. Appellant notes that the Examiner has relied only on French in rejecting claims 52-54 under § 103(a).

The Examiner is relying on the logical view of the table data illustrated in French as disclosing Appellant's data structure. However, as discussed above, French does partition the data into pages when storing a column, so the columns of the table data in French cannot be properly interpreted as forming a continuous strip of data that can be stored without regard to page size.

Furthermore, Appellant notes that the rejection of the claim 52 is based on the originally filed claim 52, not claim 52 as amended on April 30, 2004, and the newly added limitations have not been addressed in the Examiner's argument.

Accordingly, French alone cannot render Appellant's invention as claimed in claim 52 obvious, and Appellant respectfully requests the Board reverse the rejection of claims 52-54 under 35 U.S.C. § 103(a) over French.

## VIII. CONCLUSION

Because French and Larson cannot render obvious Appellants' invention as claimed in claims 1-51, and French alone cannot render obvious Appellant's invention as claimed in claims 52-54, Appellant respectfully requests the Board reverse the rejections of claims 1-54 under 35 U.S.C. § 103(a) and direct the Examiner to enter a Notice of Allowance for claims 1-54.

**Fee for Filing a Brief in Support of Appeal**

Enclosed is a check in the amount of $340.00 to cover the fee for filing a brief in support of an appeal as required under 37 C.F.R. §§ 1.17(c) and 41.37(a).

**Deposit Account Authorization**

Authorization is hereby given to charge our Deposit Account No. 02-2666 for any charges that may be due. Furthermore, if an extension is required, then Appellant hereby requests such extension.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR
& ZAFMAN LLP

Dated: DEC. 3, 2004

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## APPENDIX A FOR
## APPELLANT'S BRIEF UNDER 37 C.F.R. § 41.37

1. (Previously amended) A computerized method of storing table data comprising:

parsing the table data into columns of values, each column represented as a continuous strip of data in a temporary storage;

formatting each column into a data stream for permanent storage; and

directing a storage device to store each data stream as a continuous strip of compressed data without regard to a page size for the storage device.

2. (Original) The computerized method of claim 1 further comprising:

partitioning each column into groups of values based on a primary key for the table data; and

formatting each group of values into a data stream.

3. (Original) The computerized method of claim 1, wherein formatting each column comprises:

compressing the values in the column.

4. (Original) The computerized method of claim 3, wherein compressing the values comprises:

creating a code for each value in the column; and

replacing each value with the corresponding code.

5. (Original) The computerized method of claim 4, wherein creating a code for each value comprises:

creating a plurality of entries, one entry for each value in the column; and

deriving the code from a location for the corresponding entry within the plurality of entries.

6. (Original) The computerized method of claim 4, wherein creating a code for each value comprises:

determining a number of occurrences of each value in the column; and

deriving the code for each value from the corresponding number of occurrences.

7. (Original) The computerized method of claim 4, wherein creating a code for each value comprises:

creating a plurality of entries, one entry for each value in the column;

storing a number of occurrences of each value in the column in the corresponding entry; and

deriving the code for each value from the corresponding number of occurrences.

8. (Original) The computerized method of claim 7 further comprising:

directing the storage device to store the plurality of entries in conjunction with the corresponding continuous strip of data.

9. (Original) The computerized method of claim 7 further comprising:

directing the storage device to store the plurality of entries in a header for the corresponding continuous strip of data.

10. (Original) The computerized method of claim 4, wherein compressing the values further comprises:

encoding the codes in the column according to an encoding table.

11. (Original) The computerized method of claim 1, wherein formatting each column into a data stream comprises:

formatting multiple columns into a single data stream.

12. (Original) The computerized method of claim 11, wherein formatting multiple columns comprises linearly concatenating a series of rows, each row comprising one value from each of the multiple columns.

13. (Original) The computerized method of claim 11, wherein formatting multiple columns comprises linearly concatenating the multiple columns.

14. (Previously amended) A computer-readable medium having executable instructions to cause a computer to execute a method comprising:

parsing table data into columns of values, each column represented as a continuous strip of data in a temporary storage;

formatting each column into a data stream for permanent storage; and

transferring each data stream to a storage device for storage as a continuous strip of compressed data without regard to a page size for the storage device.

15. (Original) The computer-readable medium of claim 14, wherein the method further comprises:

partitioning each column into groups of values based on a primary key for the table data; and

formatting each group of values into a data stream.

16. (Original) The computer-readable medium of claim 14, wherein the method further comprises compressing the values in a column when formatting the column.

17. (Original) The computer-readable medium of claim 16, wherein the method further comprises:

creating a code for each value in the column; and

replacing each value with the corresponding code when compressing the values in the column.

18. (Original) The computer-readable medium of claim 17, wherein the method further comprises:

creating a plurality of entries, one entry for each value in the column; and

deriving the code from a location for the corresponding entry within the plurality of entries.

19. (Original) The computer-readable medium of claim 17, wherein the method further comprises:

determining a number of occurrences of each value in the column; and

deriving the code for each value from the corresponding number of occurrences.

20. (Original) The computer-readable medium of claim 17, wherein the method further comprises:

creating a plurality of entries, one entry for each value in the column;

storing a number of occurrences of each value in the column in the corresponding entry; and

deriving the code for each value from the corresponding number of occurrences.

21. (Original) The computer-readable medium of claim 20, wherein the method further comprises:

directing the storage device to store the plurality of entries in conjunction with the corresponding continuous strip of data.

22. (Original) The computer-readable medium of claim 20, wherein the method further comprises:

directing the storage device to store the plurality of entries in a header for the corresponding continuous strip of data.

23. (Original) The computer-readable medium of claim 17, wherein the method further comprises:

encoding the codes in the column according to an encoding table.

24. (Original) The computer-readable medium of claim 14, wherein the method further comprises:

formatting multiple columns into a single data stream.

25. (Original) The computer-readable medium of claim 24, wherein the method further comprises linearly concatenating a series of rows, each row comprising one value from each of the multiple columns, when formatting the multiple columns.

26. (Original) The computer-readable medium of claim 24, wherein the method further comprises linearly concatenating the multiple columns when formatting the multiple columns.

27. (Previously amended) A computer system comprising:

a processing unit;

a memory coupled to the processing unit through a bus;

a storage device coupled to the processing unit through a bus;

a data storing process executed from the memory by the processing unit to cause the processing unit to parse table data into columns of values with each column represented as a continuous strip of data in the memory, to format each column into a data stream for permanent storage, and to direct the storage device to store the data stream as a continuous strip of compressed data without regard to a page size for the storage device.

28. (Original) The computer system of claim 27, wherein the data storing process further causes the processing unit to partition each column into groups of values based on a primary key for the table data and to format each group of values into a data stream.

29. (Original) The computer system of claim 27, wherein the data storing process further causes the processing unit to compress the values in a column when formatting the column.

30. (Original) The computer system of claim 29, wherein the data storing process further causes the processing unit to create a code for each value in the column and to replace each value with the corresponding code when compressing the values in the column.

31. (Original) The computer system of claim 30, wherein the data storing process further causes the processing unit to create a plurality of entries, one entry for each value in the column and to derive the code from a location for the corresponding entry within the plurality of entries.

32. (Original) The computer system of claim 30, wherein the data storing process further causes the processing unit to determine a number of occurrences of each value in the column and to derive the code for each value from the corresponding number of occurrences.

33. (Original) The computer system of claim 30, wherein the data storing process further causes the processing unit to create a plurality of entries, one entry for each value in the

column, to store a number of occurrences of each value in the column in the corresponding entry, and to derive the code for each value from the corresponding number of occurrences.

34. (Original) The computer system of claim 33, wherein the data storing process further causes the processing unit to direct the storage device to store the plurality of entries in conjunction with the corresponding continuous strip of data.

35. (Original) The computer system of claim 33, wherein the data storing process further causes the processing unit to direct the storage device to store the plurality of entries in a header for the corresponding continuous strip of data.

36. (Original) The computer system of claim 30, wherein the data storing process further causes the processing unit to encode the codes in the column according to an encoding table when compressing the values in the column.

37. (Original) The computer system of claim 27, wherein the data storing process further causes the processing unit to format multiple columns into a single data stream.

38. (Original) The computer system of claim 37, wherein the data storing process further causes the processing unit to linearly concatenate a series of rows, each row comprising one value from each of the multiple columns, when formatting the multiple columns.

39. (Original) The computer system of claim 37, wherein the data storing process further causes the processing unit to linearly concatenate the multiple columns when formatting the multiple columns.

40. (Previously amended) A data storing system comprising:

a plurality of compute nodes coupled to a data source to receive table data from the data source and to parse the table data into columns of values, each column represented as a continuous strip of data in a temporary storage; and

a plurality of storage nodes, each storage node comprising a storage device and coupled to the plurality of compute nodes to receive the columns of values from the compute nodes, to format each column into a data stream for permanent storage, and to direct the storage device to store the data stream as a continuous strip of compressed data without regard to a page size for the storage device.

41. (Original) The data storing system of claim 40, wherein the plurality of compute nodes are further operable to partition each column into groups of values based on a primary key for the table data, and each storage node is further operable to format a group of values into a data stream.

42. (Original) The data storing system of claim 40, wherein each storage node is further operable to compress the values in a column when formatting the column.

43. (Original) The data storing system of claim 42, wherein each storage node is further operable create a code for each value in a column and to replace each value with the corresponding code when compressing the values in the column.

44. (Original) The data storing system of claim 42, wherein each storage node is further operable to create a plurality of entries, one entry for each value in the column, to store a number of occurrences of each value in the column in the corresponding entry, and to derive the code for each value from the corresponding number of occurrences.

45. (Original) The data storing system of claim 44, wherein each storage node is further operable to direct the storage device to store the plurality of entries in conjunction with the corresponding continuous strip of data.

46. (Original) The data storing system of claim 44, wherein each storage node is further operable to direct the storage device to store the plurality of entries in a header for the corresponding continuous strip of data.

47. (Original) The data storing system of claim 43, wherein each storage node is further operable to encode the codes in the column according to an encoding table when compressing the values in the column.

48. (Original) The data storing system of claim 40, wherein each storage node is further operable to format multiple columns into a single data stream.

49. (Original) The data storing system of claim 48, wherein each storage node is further operable to linearly concatenate a series of rows, each row comprising one value from each of the multiple columns, when formatting the multiple columns.

50. (Original) The data storing system of claim 48, wherein each storage node is further operable to linearly concatenate the multiple columns when formatting the multiple columns.

51. (Original) The data storing system of claim 40, wherein one of the plurality of compute nodes acts as a master to receive the table data from the data source and to transfer the table data and instructions for storing the table data to the other compute nodes.

52. (Previously amended) A data structure comprising:

a header field containing data representing an identifier for a column of values from a table; and

a plurality of data fields containing data representing the values in the column identified by the header field, the plurality of data fields forming a continuous stream of compressed data for storing without regard to a page size for a storage device.

53. (Original) The data structure of claim 52, further comprising:

a plurality of dictionary entries containing data representing each value in the column and data representing a count of the occurrences of the corresponding value in the

column identified by the header field, wherein the data in the plurality of data fields are codes derived from the counts of the occurrences of the corresponding values.

54. (Original) The data structure of claim 53, wherein the header field further contains data representing the plurality of dictionary entries.